



OPEN-CLOSE MECHANISM FOR SOFA BED

SPECIFICATION ~~Technical field~~CROSS REFERENCE TO RELATED APPLICATIONS

5 This application is the US national phase of PCT application PCT/IB2004/000568 filed 24 February 2004 with a claim to the priority of Italian patent application BA03A000019 itself filed 4 April 2003, the disclosures of which are herewith incorporated.

FIELD OF THE INVENTION

10 The present invention relates to a sofa bed and its open-close mechanism.

BACKGROUND OF THE INVENTION

As known, a sofa bed comprises an almost
parallelepipedal frame structure, ~~which that~~ forms an internal
15 containment area for bedding storage, and a number of
interconnected movable frames ~~, bound together~~. These frames move
according to ~~rototranslating~~ combined rotational/straight-line
motions from the closed to the open position. In the closed
position, the frames fold up to keep the mattress folded in a
20 number of ~~pieces~~ sections and stored in the area created by the
fixed structure; in the open position, the movable frames are
consecutively aligned, outside of ~~said volume~~ this area and define
a rest surface. These movements are made possible thanks to one

or more mechanisms interposed between the fixed structure and the movable frames.

Up to now, various types of similar mechanisms with at least three movable frames have been developed and many state-of-the-art mechanisms easily convert ~~[[s]]~~ the sofa into a bed without having to remove any of the cushions. The present applicant has already described and claimed a similar product in the Italian patent application BAO1A000005.

Despite the technical progress made, the known applications show still several disadvantages. The largest limitation of the known mechanisms is the risk of accidental closing. In fact, when in bed position, should the user be seated close to the hinged joint between the headboard frame ~~[[2]]~~ and the adjacent central frame ~~(3)~~, ~~both in FIG. 1~~, an accidental closing of the bed may occur.

Disclosure SUMMARY OF THE INVENTION

The invention solves the technical problem identified above, ~~because it is in~~ a sofa bed comprising an almost parallelepiped frame structure; a number of interconnected movable frames, ~~[[bound]]~~ together ~~[[,]]~~ that move according to ~~roto-~~ translating combined rotational/straight-line motions from the closed to the open position, ~~wherein~~ . According to the invention in the closed position ~~said~~ the central and headboard frames are sequentially folded up, while in the open position, they are consecutively aligned; and a mechanism is provided that moves ~~said~~ these frames, ~~characterized in that~~ . According to the invention the mechanism comprises at least one ~~lever~~ link, hinged

to the joint between the headboard frame (2), ~~said carrying the~~
headboard [[rest]], and the adjacent central frame [(3)],
preventing [[the]] lowering of the above mentioned joint. In this
way, the problem of accidental closing of the bed has been solved.

5 According to a subsequent [[aim]] object, the invention
is capable of moving the seat cushion by means of only two
additional elements.

 Furthermore ~~said this~~ mechanism has one degree of
freedom only and open and closes in one movement without removing
10 having to remove the seat and back cushions (21) and (19).

BRIEF DESCRIPTION OF THE DRAWING

 These and other advantages will be pointed out in the
detailed description of the invention that will refer to the
~~figures of tables 1/1 and 2/2 in which an exemplifying and not~~
15 showing a nonrestrictive embodiment of the invention. ~~has been~~
~~carried out. Way of carrying out the invention With reference to~~
~~the above mentioned tables~~ Therein:

[[•]] FIG. 1 shows the sofa-bed structure in the "bed"
position;

20 [[•]] FIG. 2 shows an axonometric view of the same sofa bed;

[[•]] FIGS. 3, 4 and 5 show three consecutive steps of the
sofa bed during the opening operation; and ~~Finally,~~

[[•]] FIG. 6 shows a detail of the frame in the "bed"
position.

SPECIFIC DESCRIPTION

25 With reference to the ~~previous~~ figures, the ~~mafore-~~
~~mentioned goals were~~ above-given objects are met thanks to a sofa

bed comprising a driving mechanism ~~[[,]]~~ positioned between each ~~[[/a]]~~ frame and the following one. ~~[[Said]]~~ This mechanism has synchronization tools to move the movable frames from the closed to the open position, and vice versa, in ~~[[one]]~~ a single continuous movement ~~[[only]]~~.

The sofa bed (FIG. 2) is identified with the number/reference (11), while the fixed frame structure with (7). The frame structure (7) has an almost parallelepipedal shape ~~d,~~ which that forms an internal containment area (14) and that is composed of several frames ~~. Among such frames,~~ at least one of which acts as a support for ~~[[the]]~~ back cushions 19.

The fixed structure (7) defines (FIG. 2) an internal containment area (14) ~~[[,]]~~ inside which the interconnected movable frames ~~, bound one with the other,~~ fold up to convert the sofa bed ~~[[in]]~~ to the sitting position. Then, ~~said~~ these movable frames can switch from the closed to the open position (see the sequence in FIGS. 3, 4 and 5), provided that they are aligned, forming a rest surface ~~, numbered with~~ (15).

The present mechanism ~~, numbered with~~ (10) ~~[[,]]~~ comprises synchronization tools ~~[[,]]~~ interposed between the movable frames ~~[[,]]~~ and serving to move the frames from the closed to the open position (see again the sequence in FIGS. 3, 4 and 5), and vice versa, in one movement. It comprises a quadrilateral linkage (16), a quadrilateral linkage (12) and a quadrilateral linkage (17). The lifting and opening system of ~~said~~ this mechanism is provided by the quadrilateral linkages (16) and (12), and by springs (not shown in the figures) to facilitate

the operation. In particular, a first retain elastic mean is interposed between the lever link (6) and the lever link (1), while between the lever link (1) and the fixed structure (7) is interposed a second retain elastic mean. ~~said this~~ this elastic means can also be positioned on those elements fastened to elements (6), (2) and (7). The ~~quadrilateral~~ linkage (12) provides the ~~headrest~~ headboard (2) in the bed configuration, while, in the sitting configuration, ~~said this headboard~~ this headboard headrest is vertical. The ~~quadrilateral~~ linkage (16) moves ~~synchronically~~ synchronously with the rest of the mechanism by means of lever links (8) and (9) hinged to the fixed structure (7). As an alternative to it, the lifting of ~~said this~~ this mechanism can also be obtained by means of two simple ~~quadrilateral~~ linkages (not shown in the figures), one end of each one is hinged to the fixed structure (7), and the other end is hinged to the frame (2). The two ~~quadrilateral~~ linkages are joined together by means of a lever link, ~~which makes~~ synchronous ~~that synchronizes~~ their motion. ~~said These~~ These ~~quadrilateral~~ linkages determine the vertical translation of the frame (2), ~~from bottom upward~~ during ~~[[the]]~~ opening, ~~from top~~ downward during ~~[[the]]~~ closing.

Finally, the ~~quadrilateral~~ linkage (17), shown in FIG. 6, comprising the lever links (4), (5), part of lever link (25) and part of lever link (23), moves the sliding system of the seat cushions (21).

Beside the conversion from sofa to bed, and vice versa, the mechanism has been also designed to perform follow a particular trajectory. Following this trajectory the mechanism

reaches a height above the ground that makes itself manageable, as one can see in FIG. 4. The strong point of this new mechanism is (FIG. 1) is the fact that the lever link (1) is hinged in the joint (2') between the headrest headboard frame (2) and the central frame (3). From a functional point of view, it solves the problem of accidental closing of the bed. In fact, in known mechanisms, the lever link (1) is hinged on the headrest headboard frame (2); consequently, accidental closing may occur when ~~[[to]]~~ the user is seated close to the hinged joint (2') between the headrest headboard frame (2) and the adjacent frame (3). Another strong point of this mechanism is the movement of the seat cushions (21) by means of only two additional elements. The addition of elements (4) and (5) creates an easy system based on an articulated ~~quadrilateral~~ linkage (17). An additional feature of the mechanism is that the lever link (6) can have five holes (as in the embodiment of FIG. 1), or four holes and be bolted directly to the fixed structure (7). In the case of a 5-hole lever link, the lever link (6) being hinged to the lever links (8) and (9) performs a roto-translation. In the four holes configuration, the lever link (6), instead of rototranslating, can rotate around a point fixed with respect to the fixed structure (7). This means the elimination of the lever links (8) and (9).